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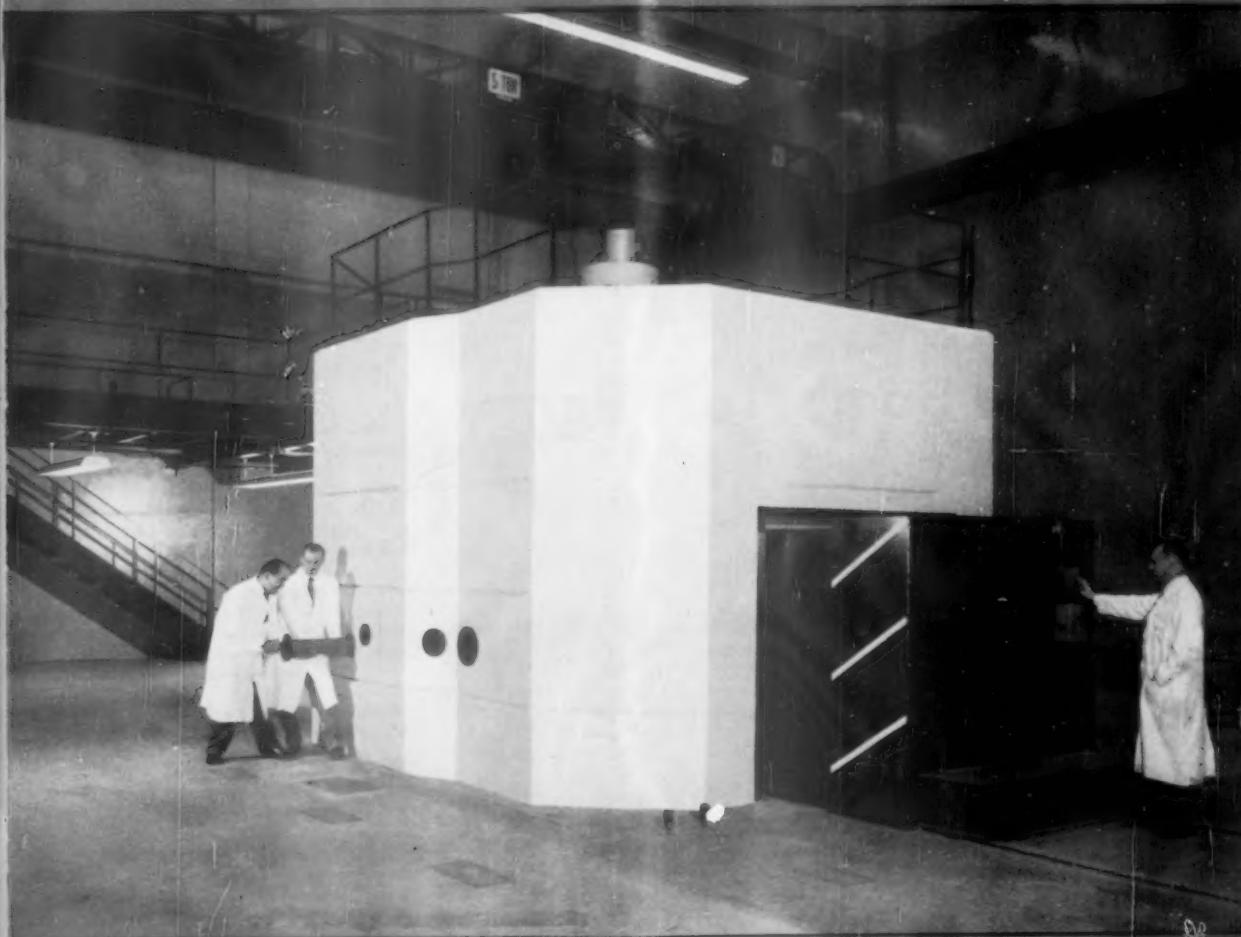
June 23, 1956

VOL. 69, NO. 25

PAGES 385-400

SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE



Private Research Reactor

See Page 392

A SCIENCE SERVICE PUBLICATION

GENERAL SCIENCE

Check Radiation Level

► HOW IS your radiation level these days?

This is the kind of question that the National Academy of Sciences inquiry suggests should be asked of everyone, for personal safety and the prevention of defective children in future generations. (See opposite page.)

In the atomic energy industry each worker carries a radiation badge, usually a bit of photographic film that is darkened by radioactivity he experiences. Inspected each week, it becomes a part of health and employment records.

In our atomic world, everyone may be asked to carry some such radiation recorder, to be inspected like one's car periodically, perhaps twice a year. Or it may suffice to require or urge a personal X-ray record upon which is entered each medical exposure to radiation. For medical radiation, on the average, is about as responsible as natural or background radiation for building up the roentgen exposure.

Radiation is feared both as a shortener of individual life and the source of future defective children when experienced by potential fathers and, to a less extent, mothers.

The Government has found it possible to keep a gigantic file of social security credits

in dollars. Perhaps doctors and dentists will be required to plow into a similar file, or the same one, the unfavorable "radiation debits."

The prospective bride might be expected to ask for radiation information on the intended groom, along with such prosaic matters as money in the bank.

Under present conditions, people may not know when they are subjected to unusual radiation risks. Atomic radiation is undetectable by the ordinary senses. If there is an atomic explosion somewhere that drops fallout on a far-distant city, the inhabitants there will not realize they have been damaged unless monitoring stations spread the warning.

At present, a network of 40 observing stations of the Atomic Energy Commission and the U. S. Weather Bureau extend across the United States. They constantly monitor radioactive fallout, helping to tell when atomic bombs are tested.

Their readings are so much more vital potentially to human health than temperature or rainfall that radiation figures might well appear in the daily weather summaries.

Science News Letter, June 23, 1956

GENERAL SCIENCE

Urge H-Bomb Test Ban

► A BAN on atomic and hydrogen bomb tests and a halt to development of intercontinental ballistic missiles is urged by a military expert and a scientist.

Col. Richard S. Leghorn, U. S. Air Force (ret.), now with Eastman Kodak Company, and Dr. David Inglis, senior physicist at Argonne National Laboratory, Lemont, Ill., call for an arms freeze now as the first step toward real disarmament.

Writing in the tenth anniversary issue of the *Bulletin of the Atomic Scientists* (June), a symposium on Science and the Affairs of Man, they appeal both to the United States and Russia to arrest the arms race before each side achieves dispersed and invulnerable bases stacked with abundant thermonuclear weapons and intercontinental missiles to deliver them.

When that happens, Col. Leghorn and Dr. Inglis charge, the "point of no return" will have been reached.

Only a halt now, they also argue, can prevent nations not possessing atomic and hydrogen bombs from developing them, resulting in a danger even less predictable and less controllable than the present danger of atomic war by one of the two armed camps.

Dr. Eugene Rabinowitch, University of Illinois botany professor and *Bulletin* editor, points out that these proposals should not be confused with that of Democratic presidential aspirant Adlai Stevenson for the

U. S. to stop its weapons tests. In rejecting the Stevenson proposal, President Eisenhower said the tests were needed to develop intercontinental ballistic missiles (ICBM) with H-bomb warheads. Both Stevenson and Eisenhower thus refused to tamper with the ICBM program, the main purpose of the Leghorn-Inglis proposal.

Although it is now well known that explosion of H-bombs anywhere on earth can be detected relatively easily, it is not so well known that a few extra-territorial, internationally manned radar stations within each large country would probably make concealment of long-range missile tests impossible.

Therefore, Col. Leghorn and Dr. Inglis suggest, "foolproof control" against perfection of ICBM's is possible without excessive interference with national sovereignty.

Because of the greater vulnerability of the American industrial economy, Russia stands to gain more than the U. S. in continuing present arms developments. It is therefore to U. S. advantage to start now to halt the contest before each side reaches the ultimate state of mutual deterrence, they conclude.

Dr. Rabinowitch points out that the Leghorn-Inglis proposals are in the United States' interest, and that the real question is whether they are also sufficiently in the interest of the Soviet Union to be acceptable to the latter.

Science News Letter, June 23, 1956

• RADIO

Saturday, June 30, 1956, 1:45-2:00 p.m. EDT
"Adventures in Science" with Watson Davis, director of Science Service, over the CBS Radio Network. Check your local CBS station.

Raymond H. Schaefer, vice-president, American Brake Shoe Corporation, Mahwah, N. J., will discuss "New Developments in Metals."

GENERAL SCIENCE

Career Status Needed for Overseas U. S. Scientists

► THE UNITED STATES can expand its overseas program of technical cooperation by giving its trained workers career status, National Planning Association policy makers have concluded.

The proposed career status for scientists and technicians, as envisioned by the NPA's Special Policy Committee on Technical Cooperation in Latin America, can be organized only if scientists and technical workers are free from political "strings."

Reporting on a three-year study of public and private technical cooperation programs were H. Christian Sonne, chairman of the board of trustees of the National Planning Association, Dr. Theodore W. Schultz, chairman of the department of economics, University of Chicago, and Herbert Emerich, director of the Public Administration Clearing House.

The study, concentrated on Latin America, was said to apply to Africa, Asia and the Middle East. There are about 1,000 United States scientists and technicians in Latin America.

The "real problem" facing technical cooperation programs was said to be "finding and keeping qualified 'shirt-sleeve ambassadors' as technical cooperation personnel."

Scientists and technicians, the experts charged, have shied away from Government jobs overseas because political affiliation cost so many jobs in 1954 and because trained workers have no place to turn after their two-year contract expires.

Science News Letter, June 23, 1956

NEUROLOGY

Nerve Nuclei Change Size With Activity

► THE NUCLEUS of a nerve cell or neuron in the brain expands and contracts with different types of activity, Drs. M. R. A. Chance, A. J. Lucas and J. A. H. Waterhouse of the University of Birmingham, England, have found.

With anesthetics and convulsions, the nerve cell nuclei in brains of mice contract in area. They are smaller, by direct measurement, than those from resting mice. When the convolution ends in a fall, the nerve cell nuclei are even smaller.

With running and swimming to exhaustion, however, the brain nerve cell nuclei get bigger than during resting, the scientists report in *Nature* (June 9).

Science News Letter, June 23, 1956

GENERAL SCIENCE

Effects Of Radiation

National Academy of Sciences after year-long study of the biological effects of atomic radiation warns that any radiation is harmful to life and urges recording each exposure.

The following is the text of the brief digest of findings and recommendations contained in the National Academy of Sciences report to the public on "The Biological Effects of Atomic Radiation."

► IT IS GENERALLY agreed that, in the peacetime development of atomic energy, man has been lucky. He has been dealing with an enormous new force whose potential effects he has only dimly understood.

Thus far, except for some tragic accidents affecting small numbers of people, the biological damage from peacetime activities (including the testing of atomic weapons) has been essentially negligible. Furthermore, it appears that radiation problems, if they are met intelligently and vigilantly, need not stand in the way of the large-scale development of atomic energy.

The continuing need for intelligence and vigilance cannot be too strongly emphasized, however.

The problems of radiation fall naturally into two main classes: (1) the effects on human beings (2) the various ways in which radiation can reach human beings through the environment.

Effects on Humans

The inheritance mechanism is by far the most sensitive to radiation of any biological system. Any radiation which reaches the reproductive cells cause mutations (changes in the material governing heredity) that are passed on to succeeding generations.

Human gene mutations which produce observable effects are believed to be universally harmful.

Everyone is subjected to the natural background radiation which causes an unavoidable quantity of so-called spontaneous mutations. Anything that adds radiation to this naturally occurring background rate causes further mutations, and is genetically harmful.

There is no minimum amount of radiation which must be exceeded before mutations occur. Any amount, however small, that reaches the reproductive cells can cause a correspondingly small number of mutations. The more radiation, the more mutations.

The harm is cumulative. The genetic damage done by radiation builds up as the radiation is received, and depends on the total accumulated gonad dose received by people from their own conception to the conception of their last child.

So far as individuals are concerned, not all mutant genes or combinations of mutant genes are equally harmful. A few may

cause very serious handicaps, many others may produce much smaller harm, or even no apparent damage.

But from the point of view of the total and eventual damage to the entire population, every mutation causes roughly the same amount of harm. This is because mutant genes can only disappear when the inheritance line in which they are carried dies out.

In cases of severe and obvious damage this may happen in the first generation; in other cases it may require hundreds of generations.

Thus, for the general population, and in the long run, a little radiation to a lot of people is as harmful as a lot of radiation to a few, since the total number of mutant genes can be the same in the two cases.

It is difficult to arrive at a figure showing how much genetic harm radiation can do. One measure is the amount of radiation, above the natural background, which would produce as many mutations again as occur spontaneously. It is estimated that this amount is 30 to 80 roentgens.

(The roentgen is a unit of radiation. To

give an idea of its value, the average dental X-ray delivers five roentgens to the patient's jaw, but only five thousandths of a roentgen of stray radiation to more remote parts of the body such as the gonads.)

It is also estimated that a dose of ten roentgens to every person in the United States would cause something on the order of five million mutant genes which would then be a part of the population's inheritance pool. This figure is subject to considerable uncertainty.

At present the U. S. population is exposed to radiation from (a) the natural background, (b) medical and dental X-rays, (c) fall-out from atomic weapons testing. The 30-year dose to the gonads received by the average person from each of these sources is estimated as follows:

(a) background—about 4.3 roentgens
(b) X-rays and fluoroscopy—about 3 roentgens

(c) weapons tests—if continued at the rate of the past five years would give a probable 30-year dose at about 0.1 roentgens. This figure may be off by a factor of five, i.e., the possible range is from 0.02 to 0.5 roentgens. If tests were conducted at the rate of the two most active years (1953 and 1955) the 30-year dose would be about twice as great as that just stated.

If the exposure of the general population to radiation is limited to levels which the genetics committee believes reasonable (see

(Continued on page 390)



BACK SEAT FLYING—In a cockpit installed in the main cabin of a T-29 airliner, a second pilot takes over control of the airplane once the regular pilot has taken it aloft. Hughes Aircraft Company engineer R. E. Moore is shown in the "plane within a plane" where test pilots can fly as though they were in an F-102 jet interceptor while ten Hughes engineers can simultaneously check operation of the electronic control system.

MEDICINE

Ileitis Often Recurs

► THE CHANCES for recurrence of regional ileitis after operation for it range from 30 in 100 to 70 in 100.

These percentages of recurrence after operation were reported at the American Medical Association meeting in Chicago by a group of surgeons from the University of Pennsylvania Graduate School of Medicine and Graduate Hospital, Philadelphia.

Dr. Isador Ravdin, University of Pennsylvania surgeon called in consultation on President Eisenhower's case, is with the University of Pennsylvania Medical School, a different part of the University.

At the Graduate School of Medicine, the recurrence rate after operation is 55% in patients followed for two to ten years. The experiences reported by other surgeons, the Pennsylvania doctors said, range from 30% to 70% recurrence.

The immediate results of operation for the condition are "excellent," the doctors said. If there is a return of the trouble, the patient may be operated on again, if there are the same complications that called for the first operation.

These Graduate School surgeons prefer an operation in which the inflamed, swollen-shut section of intestine, or ileum, is cut out. The by-pass operation performed on President Eisenhower is preferred by some other surgeons, and may have been selected because of the President's age.

MEDICINE

Poison Ivy Vaccine

► A NEW KIND of vaccination against poison ivy may come from Hawaii and the Orient. If so, it will follow the principle successfully used in the oldest vaccination procedure, that against smallpox.

Protection against smallpox is given by vaccinating with the virus of the related disease, cowpox.

For poison ivy in the United States, the new idea is to try vaccinating with extracts from mango and lacquer plants of Hawaii and the Orient. These plants are related to our poison ivy, poison oak and sumac.

This idea, with tests to back it up, was presented at the American Medical Association meeting in Chicago by Dr. Earl R. Clairborne, 327th U.S.A.F. Hospital, Parks Air Force Base, Calif., and Dr. Ervin Epstein of Oakland, Calif.

Persons born in the Orient or Hawaii, they found, are much less susceptible to poison oak than persons born in America. The doctors believe this may be due to natural immunity to the poisons built up by early exposure to the mango and lacquer plants.

In the study, almost 900 Caucasians, Negroes, Japanese, Chinese, Filipinos and Hawaiians took poison oak patch tests. In the American-born groups, reactions devel-

The immediate results and chances for recurrence are the same for both operations.

The surgeons who gave the report in an unusually timely exhibit are Drs. Herbert R. Hawthorne, Alfred S. Frobese, Paul Nemir Jr. and Robert B. Laucks.

The tranquilizing drugs may in the future be used in medical treatment of the condition, Dr. Frobese said when interviewed by SCIENCE SERVICE. So far he has not heard of their being used. Anti-spasmodic drugs such as belladonna have been used, as well as diet in medical management of the condition.

The speed with which the diagnosis was made in the President's case and the fact that it was made before the operation surprised many doctors at the Chicago AMA meeting. It is attributed to the fact that the President's physician, Maj. Gen. Howard McC. Snyder, recognized that previous attacks of digestive upsets, as they were formerly reported to the press, were attacks of regional ileitis.

The condition has been increasing in recent years. When first reported in 1932, only 14 cases were known. In the past two years, there have been reports of 1,500 to 2,000 cases, Dr. Frobese estimated. The increase is considered real. Older surgeons say they saw no cases of it 20 years ago.

Science News Letter, June 23, 1956

oped as follows: Caucasians, 58%; Negroes, 43.5%; Chinese, 45.5%; Japanese, 26%; Filipinos, 26%; and Hawaiians, 46.8%.

None of the Chinese born in China reacted. Other groups born outside the United States reacted as follows: Japanese, 3.3%; Filipinos, 6.6%; and Hawaiians, 5.7%.

So far, extracts of American plants have not been able to prevent poisoning, but the doctors suggest the stronger Oriental plants might provide extracts that would immunize susceptible persons against our native plants.

Science News Letter, June 23, 1956

ENTOMOLOGY

Measure Mosquito Rate of Digestion

► A MOSQUITO takes from one to two days to digest blood.

The length of time will determine how soon it bites again, and, therefore, how effective the mosquito is as a disease spreader.

A scientist at the University of Sydney, Australia, A. K. O'Gower, measured the digestion rates of five species of female mosquitoes and learned that some kinds digest blood faster than others. Rates vary from

31 to 48 hours, the biologist reports in the *Australian Journal of Biological Sciences* (Feb.).

In at least one species, *Aedes noto-*
scriptus, the digestion rate speeds up as the number of hours of darkness increases.

Previous experiments by other scientists show that mosquito digestion gets faster as temperatures rise. It also speeds up at low temperatures as the humidity rises.

Science News Letter, June 23, 1956

Magnesium is the lightest commercially-available metal.

About 95% of all married men under age 65 are gainfully employed.

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SURGERY

Perform Lung Operation On Hypnotized Patient

► THE FIRST REPORTED lung operation on a hypnotized patient was announced by Dr. Milton J. Marmer, chief of anesthesiology at Cedars of Lebanon Hospital, Los Angeles, at the American Medical Association meeting in Chicago.

The patient was a 25-year-old woman with a lung tumor. She was deeply hypnotized and hypnotic suggestions were continued during the two-and-a-half-hour operation. The patient obeyed all the instructions except the command to hold her breath. Because of this, a drug was given to slow down breathing for about 45 minutes. She left the hospital in "excellent condition" a week later.

Previously, operations on hypnotized patients have been confined to abdominal surgery, appendix removal, breast surgery and amputations.

Hypnotism in skilled hands, Dr. Marmer said, is the only means of anesthesia holding no danger for the patient. It makes the patient unafraid before the operation, free from pain during it and comfortable afterwards. It has the "superlative advantage" of placing no extra load on the patient's blood circulation and breathing systems, liver or kidneys.

Patients vary in their susceptibility to hypnotism. The best subjects are ordinary, normal people, the more intelligent and imaginative the better, Dr. Marmer said. Children are usually good subjects because of their imaginations.

The patient who has been hypnotized is not an automaton. He can refuse to carry out suggestions and can break the trance if the situation becomes intolerable.

The only disadvantage to hypnotism for anesthesia, in Dr. Marmer's opinion, is that it takes considerable time. This, he thinks, is more than offset by its many advantages.

Science News Letter, June 23, 1956

ENDOCRINOLOGY

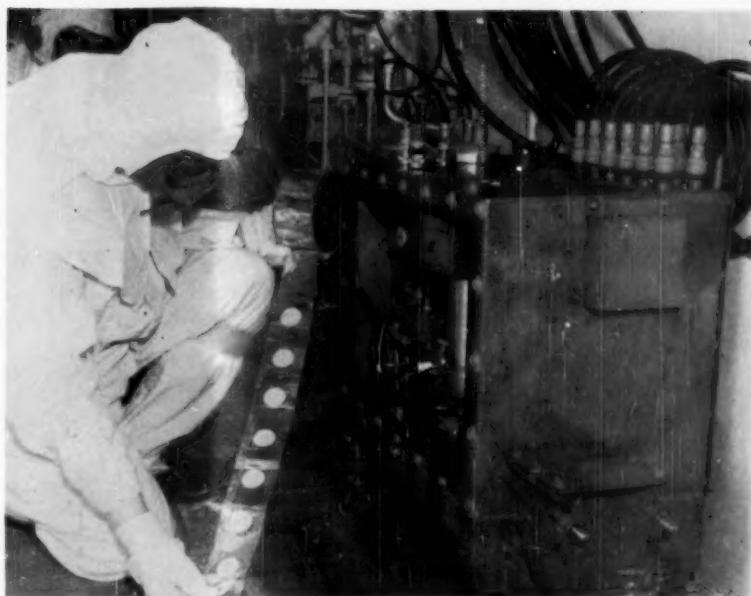
Fear Conditioning Activates Adrenals

► MONKEYS "conditioned" to show fear or anxiety when given an unpleasant stimulus put out more adrenal gland hormones while trying to avoid the stimulus, although in other conditioning experiments involving apparently less stress, they do not.

Studies showing this were reported by Dr. John W. Mason of Walter Reed Army Institute of Research, Washington, at the Endocrine Society meeting in Chicago.

The studies are part of Dr. Mason's investigation of the nervous mechanisms underlying regulation of ACTH, the pituitary hormone that influences adrenal gland hormone production. Besides seeking the nervous mechanisms, Dr. Mason is trying to find psychological reactions that go with increased ACTH secretion.

Science News Letter, June 23, 1956



ROBOT CHEMICAL ANALYZER — To recover additional plutonium valued at a quarter of a million dollars per year, General Electric Company scientists at the Atomic Energy Commission's Hanford plant have developed this automatic chemist. Liquid waste from the plutonium refinery fills dimples in the tape, and processing is adjusted if plutonium is found.

MEDICINE

Save Leukemia Victims

► SWIFT, if temporary, rescue of leukemia patients can be achieved by very big daily doses of the synthetic hormones, prednisone and prednisolone, Dr. Jos. M. Hill and associates of Dallas, Tex., reported at the American Medical Association meeting in Chicago.

These synthetic hormones first gained fame a little over a year ago as being even better than cortisone in relieving arthritis. For the leukemia patients, however, the Dallas doctors give daily doses up to 100 times the ordinary treatment dose.

Patients begin to get better within three days. The remission, or temporary recovery, lasts about two months.

One patient with chronic leukemia, however, has stayed in remission longer than nine months.

Two children in their first remissions were well enough to play such good baseball they won athletic trophies. An expectant mother was enabled to live long enough to give birth to a live, normal baby, although unfortunately she later died of a ruptured spleen, probably a result of the leukemia.

With this treatment, the Dallas doctors have been able to push the remission rate to 98% for acute lymphatic leukemia and to 74% for acute myelogenous leukemia, whereas remission rates in these leukemias have been as low as 20%. The good re-

sults have come in patients over age 30 as well as in younger ones.

A hopeful feature of the treatment is the finding that it "literally tears holes" in the leukemic cells in the blood and bone marrow. Dr. Hill thinks this may mean the treatment is really hitting the disease process.

An important, if temporary, lifesaving feature is the swift action of the synthetic hormones in big doses. It is saving patients who are so sick they would be expected to die within the first 48 or 72 hours or even two weeks.

They are too sick to wait for the anti-metabolite drugs, used in leukemia, to take effect. These drugs may take as long as two months to take effect, Dr. Hill pointed out.

The new treatment also helps patients "turn the corner" when the anti-metabolite drugs are not helping.

The synthetic hormones in big doses are used both alone and in combination with the anti-metabolite drugs. They give extra remissions and particularly, Dr. Hill stressed, they give "that last remission" when everything else has failed, and thus prolong life a bit more.

Associated with Dr. Hill in the studies are Drs. G. J. Marshall, R. J. Speer and D. J. Falco.

Science News Letter, June 23, 1956

Effects of Radiation

(Continued from page 387)

recommendations at the end of [article]), there should be practically no pathological effects in the persons receiving the radiation.

Larger exposures (say 100 roentgens and up) of the whole body or a large part of it are generally harmful. (Much higher doses may, however, be safely and usefully delivered to limited portions of the body under the controlled conditions of medical treatment.)

Very little is now known about how to treat the pathological effects of radiation or how to protect the body against them in the first place. Much research is needed in these fields.

One of the effects is a shortening of life. This seems to involve some generalized action. Irradiated individuals may age faster than normally even if they do not develop specific radiation-induced diseases like leukemia. It has not been shown that exposures small enough to be genetically tolerable have this effect. Furthermore, the permissible exposure levels that have been established for persons working with radiation appear to be within the limits of safety.

However, it is not yet known what minimum dose, if any, would be necessary to produce a statistically noticeable reduction of life span when very large numbers of people are concerned.

Environment and Food Supply

Radiation in the general environment has not yet become a serious problem. In a few decades, however, radioactive waste products from atomic power plants will represent an enormous potential source of contamination. How much of this radioactivity will actually reach the population depends on how successfully it can be kept out of the great network—ocean and air currents, food and water supplies—which connect man to his surroundings.

At present test explosions of atomic weapons are the only significant source of radiation in the general environment, above the natural background.

Meteorologists have found no evidence that atomic explosions have changed the weather or climate. Nor do they believe that continued weapons tests, at the same rate and in the same areas as in the past, would have such an effect. Radiation from explosions passes into the atmosphere and much of it eventually returns to the ground as "fall-out."

Fall-out divides into three classes: (1) close-in—material that comes down within a few hundred miles of the explosion and within 10 to 20 hours, (2) intermediate—material that descends in a few weeks after the explosion, (3) delayed—material that remains in the air for months or years.

Close-in fall-out from test explosions affects only restricted, uninhabited regions.

Intermediate fall-out would descend very slowly if it were pulled down only by

gravity. It is mostly washed out of the air by rain and snow. It spreads over large parts of the earth, but its effect over a small area may be accentuated if there is heavy precipitation while the radioactive cloud is overhead.

Delayed fall-out is stored for long periods in the stratosphere. Meteorologists know very little about the interchange of air between the stratosphere and lower layers, so they cannot predict exactly how long the material will stay up, or where it is likely to descend.

At this point the oceans are not receiving any significant quantities of radioactive material. But eventually they will undoubtedly be used as a repository for some of the radioactive waste products of atomic power plants.

Oceanic Research Needed

Before this can safely begin on a large scale, much research is needed to determine the mixing rates between various parts of the seas. Materials deposited in some of the deep parts of the ocean may remain there 100 years or more, so that most of their radioactivity would be gone before they reach surface water.

On the other hand, material dumped into coastal and other surface waters would directly affect marine life and, within a few years, would contaminate all parts of the world because of the relatively rapid circulation of surface layers.

Radioactive tracers can be used to chart ocean and air currents and to study the interrelationships of marine animals. Many important experiments in these fields will be possible only within the next 10 or 20 years. Increasing radioactive contamination of the sea and atmosphere will make it impossible after that to detect the tracers against the heightened background.

Radiation from fall-out inevitably contaminates man's food supply. Radioactive elements in the soil are taken up and concentrated by plants. The plants may be eaten by humans, or by animals which in turn serve as human food.

Long-Term Effects Unknown

At present the contamination is negligible. But the maximum tolerable level is not known. There is not nearly enough information about the long-term biological effects on man or animals from eating radiation-contaminated food. Research in this area is urgently needed.

Probably the most important potential food contaminant is strontium 90—a radioactive element that concentrates in bone tissue. Already, detectable although biologically insignificant traces of it have turned up in milk supplies thousands of miles from the site of atomic explosions.

Food from the oceans is also subject to radioactive contamination. Marine plants and animals extract and concentrate various

radioactive elements that get into sea water. The concentration is cumulative, increasing as it proceeds up the chain from microscopic plankton to edible fish.

Properly used, radiation can enhance man's food supply rather than damage it. Radiation techniques have already opened important new fields in agricultural research and will undoubtedly become increasingly valuable. No drastic change in agricultural production appears imminent, however.

Tracer studies will help us understand basic metabolic processes in plants and animals. They will also be applied to practical problems such as the use of fertilizers.

Mutation rates in plants are being artificially speeded up with radiation in the hope of producing new and superior strains. Thus far, only a few new economic varieties have been found, but the method is promising. The use of radiation to sterilize packaged food may have dramatic impact on food technology by reducing the need for refrigeration and extending the shelf-life of many products.

Holding radiation to a tolerable worldwide level will require adequate methods for disposing of, or, rather, for containing radioactive wastes from power reactors.

Some of these wastes will remain dangerously radioactive for centuries.

Research has indicated some apparently feasible systems for controlled disposal, but none is yet at the point of economic operating reality.

Routine Disposal Problem

The major problem in routine disposal is what to do with the wastes resulting from the processing of reactor fuel. The wastes from normal operations of reactors themselves can be more easily handled.

A second major problem is to anticipate the accidents that will inevitably occur and to set up safety standards which will insure that they do not become catastrophes.

Considered in this light, it appears feasible to use nuclear reactors in central station power plants and in naval vessels.

Recommendations

In the light of these findings the study committees have made a number of recommendations. Those of the genetics committee apply most directly to all of us. They are:

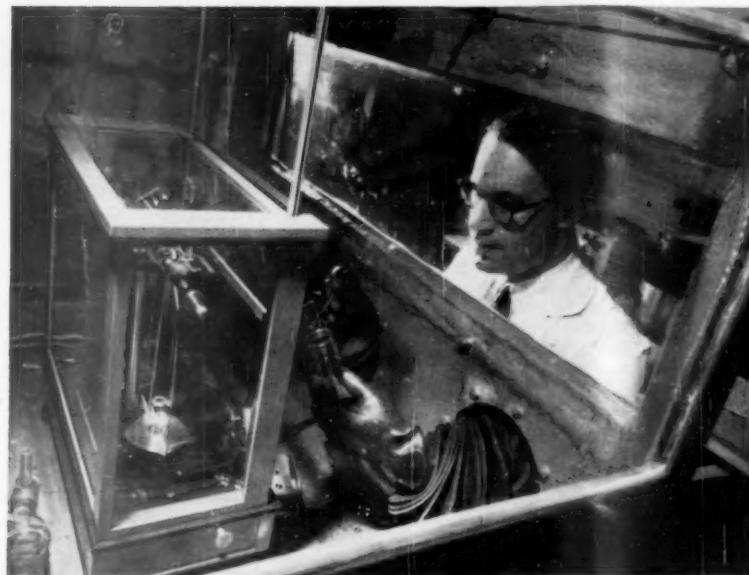
(1) Records should be kept for every individual, showing his total accumulated lifetime exposure to radiation.

(2) The medical use of X-rays should be reduced as much as is consistent with medical necessity.

(3) The average exposure of the population's reproductive cells to radiation above the natural background should be limited to 10 roentgens from conception to age 30.

(4) The 10-roentgen limit should be reconsidered periodically with a view to keeping the reproductive cell exposure at the lowest practicable level.

(5) Individual persons should not receive a total accumulated dose to the reproductive



MAGNETIC MATERIAL — Scientists of the Westinghouse Electric Corporation have perfected a magnetic material, highly purified manganese-bismuth, that promises to yield powerful permanent magnets. Dr. Alex Goldman is shown here weighing a sample, which must be handled in the inert atmosphere of helium in order to avoid the spontaneous combustion that would otherwise occur.

cells of more than 50 roentgens up to age 30 years, and not more than 50 roentgens additional up to age 40. (About half of all U. S. children are born to parents under 30, nine-tenths to parents under 40)

Other recommendations of general interest are:

(6) Techniques for monitoring worldwide fall-out should be further improved.

(7) Measurements of the storage of radiation in the stratosphere should be continued and extended.

(8) A national agency should control and keep records of all dumping of radioactive material in the ocean.

(9) An international body should set up safe standards for the marine and air disposal of radioactive materials as soon as possible, based on current knowledge.

(10) Research in marine disposal should be carried out on a cooperative international basis.

(11) Until advances in reactor technology substantially reduce potential hazards buildings that house reactors located near populated areas should be sealed against the release of radioactive materials in the event of accident.

(12) Research should be continued and accelerated, particularly in the fields of:

Fundamental genetics, mammalian genetics, human and population genetics

Pathological effects of radiation

Mixing between various parts of the atmosphere

Mixing between various parts of the oceans

The role of plants and animals, both on land and in the oceans, in concentrating radioactive materials

The tolerable levels of radioactivity in human and animal food

Geophysical and geochemical aspects of the ultimate disposal of radioactive wastes

Selection of biologically suitable sites for various atomic facilities

Safety devices for the control of accidental power surges in reactors.

The conclusions were announced by Dr. Detlev W. Bronk, Academy president, and the six committee chairmen who are leading more than 100 United States scientists in a continuing study concerning various aspects of radiation problems, both those known at present and those possibly occurring in the future.

Study committees and their chairmen are: genetics, Dr. Warren Weaver, vice-president for the natural and medical sciences of the Rockefeller Foundation; pathology, Dr. Shields Warren, pathologist of the New England Deaconess Hospital, Boston; agriculture and food supplies, Prof. A. Geoffrey Norman, University of Michigan's botany department; oceanography and fisheries, Roger Revelle, director of Scripps Institution of Oceanography, La Jolla, Calif.; meteorology, Harry Wexler, director of meteorological research, U. S. Weather Bureau; and disposal and dispersal of radioactive wastes, Abel Wolman, sanitary engineering professor, Johns Hopkins University.

Science News Letter, June 23, 1956

ZOOLOGY

Plant-Like Animals Need Nitrogen for Sex Life

► CONTROLLING NITROGEN supply in certain microscopic plant-like animals can stimulate the "mating urge."

Emil Bernstein and Dr. Theodore Jahn, University of California zoologists, have been conducting such experiments with one-celled organisms known as *Chlamydomonas*. These tiny creatures can move in water like animals and, through plant-like photosynthesis, can create their own food.

The two U.C.L.A. scientists found that the mating urge could be stimulated by increasing light intensity in the organisms' environment, reducing nitrogen in their food source or by allowing them to age.

The organisms began to reproduce sexually following such stimulus. Prior to these conditions they display little or no sexual activity, although the cells may reproduce by simple division.

Nitrogen depletion, common to the three conditions, may be the key to sexual activity. The researchers speculate that changes in nitrogen levels may have something to do with synthesis of a sex hormone-like substance in the organism.

It is possible the nitrogen factor is related to some sexual cycle in these tiny organisms that parallels the sex hormone-controlled cycle in higher organisms including man, the investigators said. This possibility is now being explored.

Science News Letter, June 23, 1956

ASTRONOMY

Will Chart Motions Of 180,000 Stars

► SOME 180,000 stars will be photographed during the next few years at Bergedorf and Bonn, Germany, to determine their proper motions, a University of Virginia astronomer has reported.

Dr. A. N. Vyssotsky of Leander McCormick Observatory said the recalculated values for the stellar motions are expected to shed new light on the size of the Milky Way galaxy in which the sun and planets are located.

The study of proper motions will also be extended to stars visible only from the Southern Hemisphere, Dr. Vyssotsky reported at a dedicatory symposium for the University of Pennsylvania's Flower and Cook Observatory near Paoli, Pa.

At the symposium, Dr. Peter van de Kamp, director of Swarthmore College's Sproul Observatory, said astronomical photography had reached such a high degree of accuracy that stars invisible even to a camera can be measured by their effects on the motions of other stars visible photographically.

Dr. F. Bradshaw Wood is the director of the new observatory, which combines the functions of the University's old Flower Observatory and its Cook Observatory.

Science News Letter, June 23, 1956

BIOCHEMISTRY

See Enzyme Cause of Athlete's Foot Itching

► DISCOVERY of an enzyme that may be responsible for the itching and blisters of fungus skin infections such as athlete's foot is announced by Drs. C. N. D. Cruickshank and M. D. Trotter of the University of Birmingham Medical School, England, in *Nature* (June 9).

They studied a fungus called *Trichophyton mentagrophytes*. When material filtered from cultures of this fungus was incubated with thin slices of guinea pig ear skin for about two hours, the top layer of skin could be separated from the under layers with a forceps.

Other tests showed that the skin-splitting ability of the fungus is probably due to a protein-digesting enzyme. Protein digesting enzymes cause itching when injected into the skin, it has previously been shown by another scientist.

Besides incriminating the enzyme as the cause of fungus infection itching, the scientists believe it plays another part in fungus infections. As the fungus grows in the superficial layers of the skin, they suggest, the enzyme diffuses from it, and loosens the skin attachments. Consequently in areas exposed to friction, blisters readily appear.

Science News Letter, June 23, 1956

METEOROLOGY

Take Pictures of Snow Crystals With New Device

► A JAPANESE SCIENTIST, Dr. Keiji Higuchi of Hokkaido University, has devised an instrument so simple and convenient to use anyone can take pictures of snow crystals—next winter, that is.

It consists of a portable dark box containing a holder for photographic paper and a small flashlight bulb, set about two feet apart. Several three-by-four-inch glass plates are prepared by treating the surface of each with silicone oil to repel water.

The apparatus and glass plates are cooled to outdoor temperature. After being exposed briefly to falling snow, a glass plate is put into the dark box directly on the film holder.

By opening the film holder and shining the light from above for a few seconds, shadows of the crystals are produced on the photographic paper.

The image produced is "nearly full size and very clearly shows" the crystal's outline, Dr. Higuchi reports in the *Journal of Meteorology* (June).

For anyone who wants his own shadow photograph of a snowflake, come next winter, that completes the outdoor procedure.

However, because Dr. Higuchi developed the new method to study the form, size and mass characteristics of snow at intervals of several minutes during a snowfall, he next warms the glass plate slowly. The individual snow crystals melt into hemispherical droplets.

SCIENCE NEWS LETTER for June 23, 1956

The plate is again placed in the dark box and a shadow photograph taken by the same method. From the image's diameter, Dr. Higuchi can calculate the volume of each droplet.

He conducted his experiments in an igloo halfway up Mt. Tokachi and Mt. Taisetsu on Hokkaido, and obtained about 100 sets of records of the shapes and sizes of snow crystals.

Two kinds of snowflakes were found in the same snowfall, one made of crystals nearly the same size, the other containing crystals of various sizes. Studying combined crystals of two sizes, Dr. Higuchi notes, is important for investigating how snow crystals clump together, thus shedding light on the mechanism of precipitation.

The number of snow crystals in a snowflake about an inch and a half in diameter has been estimated to be about 4,000.

Science News Letter, June 23, 1956

MILITARY TACTICS

Urge Foxhole Diggers And Combat Shields

► THE MECHANIZATION of foxhole digging and a return to the use of the shield in modern warfare are advocated by Col. Henry E. Kelly, U.S.A., retired.

In *Army* (June), a publication of the Association of the United States Army, Col. Kelly points out that the change in warfare thinking brought about by atomic weapons necessitates a corresponding change in the rectangular foxhole, popular with the infantryman since late in World War I.

Col. Kelly says the Army ought to ditch the box-like hole in favor of a round hole, 28 to 30 inches in diameter.

The circular pit, he states, was used effectively by the Germans in World War II. It offers the infantryman a 100% reduction in digging and increases protection against blast, flame, radiation and other combat dangers. Col. Kelly goes one step further, however, and states that the Army needs a mechanical foxhole digger.

"The circular hole is a bit more difficult to dig by hand, but mass production of such atomic foxholes seems feasible except by troops digging in under direct fire. The present commercial telegraph-pole digger, working as an earth-screw, can be redesigned to produce a 28-inch diameter hole four feet deep, in less than a minute."

Man-portable models of such an earth-digger, Col. Kelly says, could be helicopter-lifted where needed.

As for the return to shields, Col. Kelly points out that atomic warfare will mean the need for more overhead cover than ever before. By using the circular foxhole, a shield made of fireproof body armor material to fit over the hole would protect the infantryman against shell fragments, as well as blast, flash burns and some radiation. He foresees the shield designed to be carried by the infantryman and used as a packboard and battlefield shield.

Science News Letter, June 23, 1956

IN SCIENCE

BIOCHEMISTRY

Enzyme Method Helps Detect Stomach Cancer

► AN ENZYME CHEMICAL is being used in development of a stomach cancer test at the University of Michigan, the American Cancer Society announced.

Stomach cancer is difficult to detect in its earliest stages and, consequently, is one of the deadliest of all cancers.

The enzyme in the new test is chymotrypsin. It can digest the mucin in the stomach contents, making it easier to find any cancer cells present when the stomach contents are examined under the microscope.

In the test the chymotrypsin, and a mild alkaline solution are run into the stomach via stomach tube. The material is then sucked out via the tube, centrifuged and the sediment examined for cancer cells.

The method was developed by Dr. Robert J. Bolt. Although not foolproof, it is said to be as good as more complicated methods involving use of brushes, balloons or sponges to get cancer cells out of the stomach for diagnostic examination.

Science News Letter, June 23, 1956

PHYSICS

First Industrial Reactor Free of Restrictions**See Front Cover**

► A NUCLEAR REACTOR without a security clearance will be in operation at the Armour Research Foundation of the Illinois Institute of Technology.

Shown in the photograph on the cover of this week's SCIENCE NEWS LETTER, it is the nation's first peacetime private reactor designed solely for industrial research.

The reactor, housed in a new \$1,250,000 building, resulted from a unique financing plan between the Foundation and 24 American industrial firms. Under the share-the-results plan, each company put up \$20,000 toward the cost of the plant. In return all data resulting from reactor studies will be shared with the participating companies during the next three years.

The biggest problem in setting up the industrial reactor was the fact it is located in a highly populated section of Chicago's South Side. To protect the reactor's human neighbors, elaborate safety devices have been built in and around the atomic reactor.

A homogeneous water reactor, the 50,000-watt research tool was designed and built for the Foundation by Atomics International, a division of North American Aviation, Inc.

Science News Letter, June 23, 1956

CE FIELDS

MEDICINE

Atomic Medical Test For Digestive Disease

► ATOMIC AGE MEDICINE has given doctors a new test for digestive tract disorders and a new way to study the functioning of stomach and intestines.

The new test is expected to help in diagnosing cancer of the pancreas, chronic and acute inflammation of the pancreas, some diseases of the small intestine, and nutritional abnormalities following operations for duodenal and stomach ulcers.

For the test, the patient eats a fat substance tagged with radioactive iodine in peanut oil. The fat substance is glycerol trioleate.

Four to six hours later, blood samples are studied for radioactivity. Eliminated material is studied over a 48-hour period.

In patients without gastro-intestinal disorders, radioactive levels are high in the blood and low in the waste material. Reversed levels indicate certain abnormalities in intestinal function.

The test may be used to study the value of certain types of treatment, as well as to investigate more clearly and more accurately certain physiological aspects of the intestine function.

The test was developed by Dr. George J. Baylin, A. A. Sanders, and Drs. Joseph K. Isley, William Shingleton and Julian M. Ruffin of Duke University School of Medicine, Durham, N. C. They reported it at the American Medical Association meeting in Chicago.

Science News Letter, June 23, 1956

METEOROLOGY

H-Bomb War Might Cut Earth's Solar Heat

► AN H-BOMB WAR might change the amount of heat the earth receives from the sun, but a meteorologist has found "no evidence" of a decrease in solar radiation during or following the Pacific thermonuclear tests in the spring of 1954.

D. Lee Harris of the U. S. Weather Bureau, Washington, told the American Meteorological Society meeting in Seattle it is "unlikely" that H-bomb explosions over coral islands or sea water produce radiation changes large enough to be detected against natural variations.

However, he said, radical changes in the design of explosions, as might occur in a thermonuclear war, could result in important differences in the earth's heat balance.

Foreign scientists, particularly in Japan, have charged that the Pacific H-bomb tests spewed sufficient dust into the air to interfere with solar radiation, and thereby changed Japan's weather in the summer of

1954. That enough particles high in the atmosphere do affect the amount of solar radiation reaching the earth's surface is known from volcanic explosions.

The eruption of Krakatoa in 1883, Mr. Harris said, is estimated to have tossed some four to 13 cubic miles of earth into the air, of which perhaps one-eighteenth remained suspended as fine particles high in the atmosphere for more than a year. More recent records studied by Mr. Harris show a world-wide decrease in the "intensity of direct solar radiation" in the fall of 1953.

Mr. Harris believes this "nose dive of a few percent" is due to the eruption of Mt. Spurr, Alaska, in July, 1953. Dust from this volcanic explosion, still in the air in 1954, could have masked any possible effect from the spring Pacific H-bomb tests.

Mr. Harris' calculations on possible effects of future H-bomb explosions were based on scattering theory, the announced size of the Ivy Mike (Nov. 1952) crater and published information concerning particle sizes of dust thrown out of thermonuclear craters.

Science News Letter, June 23, 1956

MEDICINE

Ultrasonic Treatment For Pitcher's Elbow

► ULTRASONIC RAY TREATMENT plus hydrocortisone injections have completely relieved 97% of painful pitcher's elbow victims, Dr. John H. Aldes of Los Angeles reports in the official journal of the American Academy of General Practice, *GP* (June).

Pitcher's elbow is known medically as epicondylitis. Sportsmen also know it as tennis elbow, golfer's elbow, and badminton and squash player's elbow. Writer's cramp is another name for it.

It has attacked others besides athletes. Housepainters, bricklayers, carpenters, welders, plumbers, machinists and housewives have been its victims.

The ultrasonic treatment is performed by using a coupling agent, such as water or an oil of high viscosity, between the treatment head of the apparatus and the area to be treated.

Ultrasonic radiation creates a "micro-massage" of the cellular tissues. The mechanical vibrations increase blood supply, stimulate metabolism and cause pain to subside. Dr. Aldes said heat is present comparable to that produced by local application of shortwave diathermy.

The coupling agent in the first part of the ultrasonic radiation treatment is liquid petrolatum applied over the elbow and the forearm. The radiation is applied to the area of pain in the elbow by means of a cone-shaped applicator attached to a regular transducer.

The second part of the ultrasonic therapy is performed under water using water as the coupling agent. Treatment is given over the entire extensor area of the forearm and is administered with a gliding, rotating movement.

Science News Letter, June 23, 1956

BIOLOGY

Study Lobster Heart's "Miniature Brain"

► HOW COMPLEX SYSTEMS of nervous units act together to produce behavior is being studied in the "miniature brain" of lobsters' hearts.

The tiny clump of nine nerve cells that controls the lobster's heartbeat is being studied by Drs. Donald Maynard, S. Hagiwara and C. Terzuolo of the University of California at Los Angeles, under direction of Dr. Theodore Bullock.

By placing microscopic electrodes in the nerve cells, they have recorded the electrical activity generated by them. This energy comes from two groups of nerve cells, four small ones and five large ones.

The small cells apparently stimulate the large ones, which in turn cause the quick, rhythmic heart contractions. The nervous energy is fired in bursts.

It has been suggested a lobster's heart is a model organism capable of very simple behavior patterns—rhythmic, coordinated contractions. The "miniature brain" with its relative autonomy and spontaneous, integrated and patterned activity shows strong resemblance to a central nervous system.

These factors give hope, the researchers say, that the study of the lobster heart system may lead to a better understanding of the infinitely more complex system by which our brain sends commands to our muscles.

Science News Letter, June 23, 1956

MEDICINE

Sound Waves Used For Cancer Detection

► A KIND OF RADAR method to detect cancer of the breast and other soft tissues was shown in an exhibit at the American Medical Association meeting in Chicago by Dr. J. J. Wild, Dr. John M. Reid and Paul Wolf of St. Barnabas Hospital, Minneapolis, Minn.

Instead of radio waves, the cancer detection radar method uses very high energy sound waves.

The inaudible echo as the sound waves pass through the tissues is picked up electronically to give both a picture and a zig-zag line. For a given range or depth of tissue, cancer returns more sound than normal tissue.

Non-malignant tumors and cysts send back no sound. The contrast between cancer and normal tissue is called better than that obtained in X-ray pictures.

For breast cancer, the "echographic" or radar method can detect a cancer no bigger than a period.

The method is now being applied to the detection of such internal cancers as stomach, rectum, prostate and neck of the womb. Besides being used for cancer detection, the method is expected to give further knowledge of other conditions in the body.

Science News Letter, June 23, 1956

ASTRONOMY

Mars Enters Evening Sky

The red planet is now brightening as it approaches its very close visit of Sept. 7, when it will come within 35,120,000 miles of the earth, its closest brush since 1924.

By JAMES STOKLEY

► WITH THE COMING of July, the planet Mars enters the evening sky, getting ready for the close approach it will make later in the summer, when it will be nearer than at any time since 1924.

At the beginning of July, Mars rises in the southeast about 11 p.m., your own variety of standard time, but day after day it comes up earlier. By the end of July, it will rise about two hours after the sun has set.

Mars does not show on the accompanying maps, which depict the sky as it looks about 10:00 p.m., your own kind of standard time, at the start of July; 9:00 p.m. at the middle and 8:00 p.m. at the month's close. (Add one hour for daylight saving time.)

However, Mars is in the constellation of Aquarius, the water carrier, part of which is shown, low in the southeast to the left of Capricornus. Its brightness, on the astronomer's magnitude scale, is minus 1.3 at the middle of July, which is brighter than any other planet or star in that part of the sky.

Mars Easy to Spot

This, with its ruddy color, makes Mars easy to identify.

Two other planets are shown on our maps. One is Jupiter, similar to Mars in brightness, low in the west in Leo, the lion. Earlier in the evening Jupiter can be seen higher, in the southwest, close to the star Regulus (which is below the horizon at the times for which the maps are drawn).

Toward the south, in Libra, the scales, we find Saturn, about a sixth as bright as Jupiter.

Of the summer evening stars, the brightest is Vega, in Lyra, the lyre, which is high in the east. With magnitude 0.1, it is about half again as bright as Saturn, but about a quarter as bright as Mars or Jupiter.

Another bright star is Arcturus, in Bootes, the bear-driver, seen high in the southwest. Below this group stands Virgo, the virgin, with Spica. To the left is Libra, in which Saturn now stands, and to the left of that we come to the scorpion, Scorpius, with the star called Antares, which means the rival of Mars, given because of its red color.

The two other first-magnitude stars shown on our maps are both toward the east. One is Altair, in Aquila, the eagle, and the other is Deneb, in Cygnus, the swan, a little higher and farther north.

The planet Venus, which so brilliant in the western evening sky during the spring, has now shifted to the morning sky, and is equally brilliant in the east before sunrise. Mercury, the fifth planet that reaches naked-eye visibility, will not be visible during July.

As Mars draws in for the close approach it will make to the earth in September, astronomers all over the world, and particularly in the Southern Hemisphere, are training their telescopes on it.

Since it last came as close on Aug. 22, 1924, many new techniques have been developed, bigger telescopes have been built, and high-speed photographic films, both for color and black and white, which give fine-grain images capable of great enlargement, have been made available.

Solution of Puzzles

Thus, it is hoped, this year's observations may go far to aid in a solution of the puzzles that Mars has presented.

At the beginning of 1956, Mars was far away, on the opposite side of the sun, at a distance of nearly 200,000,000 miles. But all year it has been moving closer.

On July 1, it is 57,880,000 miles away from the earth, but at the end of the month, this will be reduced to 43,548,000 miles. The closest approach will come on Sept. 7, when Mars will be 35,120,000 miles away. In 1924, it came even nearer, but not in this century will those conditions be equalled.

The mean distance of Mars from the sun is 141,690,000 miles, about one and a half times that of the earth (93,000,000 miles). The "year" of Mars, the time it takes to encircle the sun, is equal to one of our years and ten and a half months.

Every 780 days (nearly two years and

two months) the earth catches up to Mars and passes it. Therefore, if each of the orbits were perfectly circular, every 780 days earth and Mars would be separated by only 48,690,000 miles (the difference between the distances of the two planets from the sun).

However, neither of the orbits is circular. Both are pulled out into ellipses. In January the earth is about 3,000,000 miles nearer the sun than in July, while the orbit of Mars is even more eccentric. Its distance from the sun varies by more than 26,000,000 miles.

Opposition Distances Vary

When we pass Mars that planet is said to be in "opposition" i. e., it is directly opposite the sun in the sky. If this occurs when Mars is at its greatest distance from the sun, as it did in February, 1948, the nearest the two bodies approach is about 63,000,000 miles.

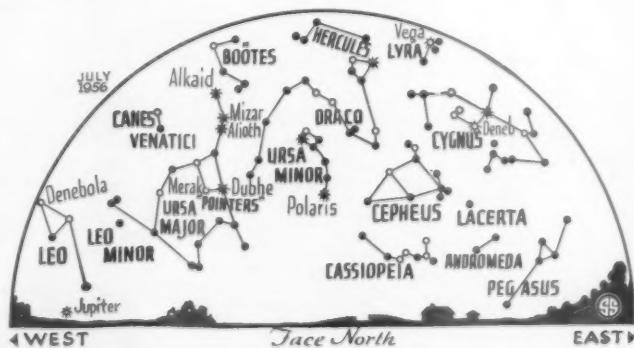
About Aug. 28, however, the earth passes the place in Mars' orbit where it comes closest the sun, and if Mars happens to be there at that time the two planets are only 34,500,000 miles apart. Such a condition was nearly realized in 1924, when the opposition occurred Aug. 22.

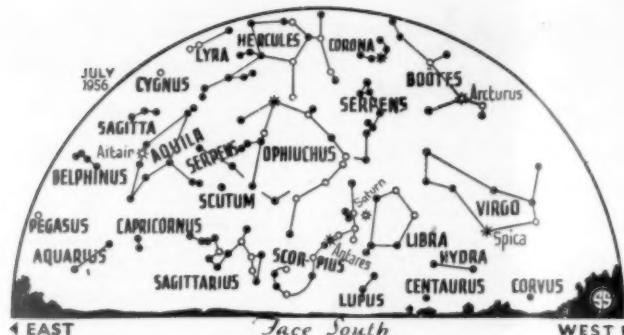
The next favorable opposition came on July 23, 1939, when Mars was 36,171,000 miles away.

When Mars does make a close approach, it is always far south in the sky, which means it is low for astronomers in the Northern Hemisphere where most of the big observatories are located.

However, in recent years several big telescopes have been erected in the Southern Hemisphere.

The newest is a 74-inch reflector officially opened at the Australian Commonwealth Observatory on Mt. Stromlo, near the capital city of Canberra, last November. One slightly larger, of 76 inches diameter, is located at the Radcliffe Observatory of Oxford University, in Pretoria, South Africa.





• * • SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS

Of the world's telescopes now in operation, there are only three exceeding these in size.

In addition, there are several large refracting, or lens-type, telescopes in the Southern Hemisphere, which may be used on Mars this summer. The largest of these, one with a 27-inch lens, belongs to the University of Michigan and is located at Bloemfontein, South Africa.

In 1954, as Mars approached within 39,800,000 miles on July 2, this fine instrument was employed by Dr. Earl C. Slipher of the Lowell Observatory at Flagstaff, Ariz., which has long specialized on Mars. These observations were supported by the National Geographic Society, and they provided a sort of practice run for 1956, as well as being of great value in themselves.

Since the unusually favorable opposition of Mars is doubtless the most important astronomical event of 1956, the next two star maps will be devoted to that planet,

and some of the things that make it interesting to scientists.

Celestial Time Table for July

July EST

1	3:40 a.m.	Moon in last quarter.
4	8:00 p.m.	Earth farthest from sun, distance 94,455,000 miles.
6	12:12 p.m.	Moon passes Venus.
7	11:37 p.m.	New moon.
8	6:00 a.m.	Moon nearest, distance 222,100 miles.
11	2:26 a.m.	Moon passes Jupiter.
14	3:46 p.m.	Moon in first quarter.
17	9:45 a.m.	Moon passes Saturn.
22	6:00 a.m.	Moon farthest, distance 252,500 miles.
	4:29 p.m.	Full moon.
27	9:28 a.m.	Moon passes Mars.
30	2:31 p.m.	Moon in last quarter.

Subtract one hour for CST, two hours for MST, and three for PST.

Science News Letter, June 23, 1956

GEOPHYSICS

Earth Satellites May Circle for Ten Years

THE EARTH SATELLITES to be launched during the International Geophysical Year that starts July 1, 1957, may circle the globe for as long as ten years, Dr. Fred L. Whipple, director of the Smithsonian Astrophysical Observatory, Cambridge, Mass., has reported.

However, the artificial moonlet could burn out as it spiraled toward the earth about a month after it was shot toward space, Dr. Whipple said. Observations of the satellite will lead to an accurate determination of the upper atmospheric density to an altitude of some 300 miles. If the density is as low as a million-millionth of the sea level value, Dr. Whipple predicted, the satellite's lifetime would be limited to less than a year.

Observations of the satellites will also help to indicate the earth's shape to an accuracy of 30 feet, Dr. Whipple reported. He spoke at a dedicatory symposium for the University of Pennsylvania's Flower and Cook Observatory near Paoli, Pa.

Science News Letter, June 23, 1956

MEDICINE

Diabetics Normal in I.Q. and Personality

DIABETIC PATIENTS are normal in intelligence and personality, Drs. A. J. Kubany, T. S. Danowski and C. Moses of the University of Pittsburgh School of Medicine, Pittsburgh, reported at the American Diabetes Association meeting in Chicago.

Previously, there have been conflicting reports on this. Diabetics have been said to have less than average intelligence or to be particularly brilliant intellectually. Some authorities have reported more behavior problems and personality disorders in diabetics, while others have said they found the opposite true.

To learn more about these matters, the Pittsburgh scientists gave a standard personality test and a standard intelligence test to 40 diabetics in the late adolescent and early adult age range. They all had developed diabetes before the age of 16.

The mean intelligence of the group on the Stanford-Binet test was 103. National norms for this are 90 to 110.

On the Minnesota Multiphasic Personality Inventory, the young diabetics showed some abnormalities when compared to the general adult population. When compared to normal young people of the same age, however, these differences disappeared.

The abnormalities that a number of scientists have noted and generalized to all diabetics may, the Pittsburgh doctors suggest, be the reaction after diabetes starts to the person's finding he has diabetes and to the doctor and the regimen of tests, regular visits, diet and so on he prescribes.

Science News Letter, June 23, 1956

OPTICAL STAR FINDER



With one eye to the instrument and one eye to the sky optical illusion "projects" the battery illuminated chart on the heavens to name the stars, locate the planets and identify the constellations. Easily used. No technical knowledge required. Offered complete with satisfaction guaranteed. \$1.98 postpaid. California residents: add 6¢ sales tax.

Stars—Planets—Constellations—their stories are recorded in the skies. There before your eyes are the eternal records of the birth of science and history.

Not a telescope but a brand new optical method of positioning the outlined figures of the constellations on the night sky and directly naming the stars.

A precision instrument not a gadget. Charts register accurately over the actual stars in the night sky. Complete sky coverage with 30 illuminated charts for your study and enjoyment.



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Books of the Week

For the editorial information of our readers, books received for review since last week's issue are listed. For convenient purchase of any U. S. book in print, send a remittance to cover retail price (postage will be paid) to Book Department, Science Service, 1719 N Street, N.W., Washington 6, D.C. Request free publications direct from publisher, not from Science Service.

THE BIOLOGICAL EFFECTS OF ATOMIC RADIATION: A Report to the Public—From a Study by the National Academy of Sciences—*National Academy of Sciences-National Research Council*, 40 p., paper, free upon request direct to publisher, Washington 25, D.C. The inheritance mechanism is by far the most sensitive to radiation and the effect is cumulative until the end of the child-bearing years. (See p. 387.)

THE BIOLOGICAL EFFECTS OF ATOMIC RADIATION: Summary Reports—From a Study by the National Academy of Sciences—*National Academy of Sciences-National Research Council*, 108 p., paper, free upon request direct to publisher, Washington 25, D.C. This study was conducted by committees made up of more than 100 leading scientists. (See p. 387.)

ELECTROMAGNETICALLY ENRICHED ISOTOPES AND MASS SPECTROMETRY: Proceedings of the Conference Held in the Cockcroft Hall, Harwell 13-16 September 1955—M. L. Smith, Ed.—*Academic*, 272 p., illus., \$8.00. The most versatile instrument for isotope enrichment for nuclear research is the mass spectrometer.

ENGINEERING PROBLEMS — Charles Angevine Hutchinson, Leon Watson Rutland, Jr. and Walter Wayne Varner—*Harper*, 181 p., \$3.00. Text for a college freshman course to parallel

college algebra, trigonometry, analytic geometry, and perhaps an introduction to calculus. An attempt is made to give the student some realization of the close relationship between applied mathematics and engineering.

THE EXPLORATION OF MARS—Willy Ley and Wernher von Braun—*Viking*, 176 p., illus., with paintings by Chesley Bonestell, \$4.95. As soon as a manned satellite station is established in space, the authors believe that an expedition to Mars will be feasible. Here is described our present knowledge of the planet as well as most accepted theories.

THE FOUNDATIONS OF SCIENCE—Sheeldon J. Lachman—*Hamilton Press*, 130 p., paper, \$1.50. Intended to be sufficiently simple, brief and broad to permit the college student to obtain quickly an orientation in the essentials of science as a constructive and creative enterprise.

FREE AND INEXPENSIVE LEARNING MATERIALS—Division of Surveys and Field Services, George Peabody College for Teachers, 7th ed., 244 p., paper, \$1.00. Listing 3,833 entries alphabetically by subject from accident prevention to youth problems.

FUNCTIONAL MATHEMATICS, Book 4—William A. Gager, Luther J. Bowman, Carl N. Shuster and Franklin W. Komomo—*Scribner's*, 578 p., illus., \$3.40. One of a six-book series, this volume for the 12th grade is intended to prepare students for college or for life if they do not go to college.

THE GENUS ACHLYA: Morphology and Taxonomy—Terry W. Johnson, Jr.—*University of Michigan Press*, 180 p., illus., \$4.50. Describing all the known species of one of the important genera of water molds.

HUMAN RELATIONS IN INTERNATIONAL AFFAIRS: A Guide to Significant Interpretation and Research—Seymour W. Beardsley and Alvin G. Edgell—*Public Affairs Press*, 40 p., paper, \$1.00. An annotated bibliography.

INDUSTRIAL ELECTRONICS: In Questions and Answers—Edward J. Bokstein—*Frederick Unger*, 197 p., illus., \$3.95. Combining the high information-to-words ratio of a reference book with the readability of an introductory text.

INTRODUCTORY ORGANIC CHEMISTRY: With Certain Chapters of Biochemistry—E. Wertheim and Harold Jeskey—*McGraw-Hill*, 3d ed., 476 p., illus., \$5.50. A standard text, now in its 14th year of publication, for students of home economics, agriculture, veterinary science and nutrition, as well as for those preparing for medicine, dentistry or pharmacy.

MATHEMATICAL ANALYSIS: A Modern Approach—Walter T. Hamilton and John Raymond Hamilton—*Harper*, 379 p., illus., \$7.50. An introductory text for engineering and physics majors.

PAN AMERICAN SANITARY ORGANIZATION, ANNUAL REPORT OF THE DIRECTOR OF THE PAN AMERICAN SANITARY BUREAU, REGIONAL OFFICE FOR THE AMERICAS OF THE WORLD HEALTH ORGANIZATION—Fred L. Soper, Director—*Pan American Sanitary Bureau, Official Documents No. 16*, 151 p., illus., paper, free upon request direct to publisher, 1501 New Hampshire Ave. N.W., Washington 6, D.C. Reporting the exciting story of disease control and elimination in the Americas. Also available in Spanish.

RITUAL AND CULT: A Sociological Interpretation—Orrin E. Klapp—*Public Affairs Press*,

Annals of American Sociology, 40 p., paper, \$1.00. Modern man, says the author, is afraid of ritual. Yet the fact of the matter is that we could not live without ritual, such as social protocol and political conventions.

SCIENCE AND INFORMATION THEORY—Leon Brillouin—*Academic*, 320 p., illus., \$6.80. Based on lectures, delivered before engineers at International Business Machines Corporation, on a new theory founded on probability.

SOLID STATE PHYSICS: Advances in Research and Applications, Volume 2—Frederick Seitz and David Turnbull, Eds.—*Academic*, 468 p., illus., \$10.00. Although the recent rapid growth of this field of physics has not been characterized by radical changes in basic physical theory, it has greatly extended the theory and the understanding of its implications.

THE SPIRIT OF THE WILD—William J. Long—*Doubleday*, 256 p., illus., \$4.00. Delightful writings of a clergyman-naturalist who died in 1948, leaving this unpublished material in his safe.

TRAFFIC ACCIDENTS AND VIOLATIONS—Paul K. Eckhardt and John C. Flanagan and others—*Highway Research Board, Bulletin 120*, 54 p., illus., paper, 90 cents. Of interest to every automobile driver and those concerned with safety on the highway. Highway design is apparently ahead of the drivers.

Science News Letter, June 23, 1956

PSYCHIATRY

Mental Cure Rate Increased One-Third

► PATIENTS with chronic mental illness at the Veterans Administration Hospital, Northampton, Mass., are recovering and leaving the hospital at a 36% greater rate, thanks to the new tranquilizing drugs, hospital authorities announced.

During the last six months of 1954, when few patients were getting these drugs, 86 recovered and were discharged. During the last six months of 1955, when extensive drug treatment was given, 118 were discharged.

While many VA hospitals are now joining in a thorough study of all phases of the new drug treatment, the Northampton hospital was the first to announce results. The experience is much the same as in other VA hospitals, preliminary reports have shown.

Among patients hospitalized five years or longer, the percentage of improved cases increased even more when these patients were treated by drugs as compared to other types of treatment, Dr. Lionel M. Ives, director of professional services at the hospital, reported.

Thirty-three were discharged among this group as compared to 19 the year before without benefit of drugs, or a 77% increase. In the less-than-five-year-group, 85 were discharged against 66 or a 29% increase.

Dr. Ives stressed that the new drugs are not a cure for disturbed mental patients. They do calm disturbed patients, so that they may be permitted more freedom within the hospital and can participate daily in the more accepted forms of therapy that prepare them for quicker discharge.

Science News Letter, June 23, 1956

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PSYCHOLOGY

Play One-Armed Bandit In Interests of Science

► THE MORE FREQUENTLY a slot machine pays off, the quicker will the player give up pulling the handle after it stops rewarding him.

This negative effect of the payoffs was discovered in experiments conducted at Northwestern University by Drs. Donald J. Lewis and Carl P. Duncan.

The familiar "one-armed bandit" was used in the experiments, but the machine was rigged so the psychologist could set it to pay off from eight times out of eight pulls down to never. After eight pulls, no one was paid off. After that, the pulls were counted to see who would persist the longest.

Obviously, the man who has found that the machine pays off only once out of eight pulls will keep pulling longer, hoping for a payoff, than will the man who has been paid off on every pull or every other pull.

The 350 men and women college students who took part in the gambling experiment did not play with their own money. The machine worked on chromium plated steel disks, and each student was permitted to help himself to these out of a cash drawer and feed them to the one-armed bandit.

When he was paid off, the disks came from a separate supply held in a special reservoir in the machine. At the end of play, each disk could be cashed in for a nickel. The familiar lemons and oranges turned up in the window of the machine.

The first ones to quit playing the machine were those who had been rewarded on every single play until payoff stopped after the eighth pull. Details of the experiment are reported in the *Journal of Experimental Psychology* (July).

Science News Letter, June 23, 1956

MEDICINE

Speed Worm Cure to Days Instead of Weeks

► CURE of two worm infections can now be achieved in one week or less instead of the two to three weeks formerly needed, Drs. Harold W. Brown, Kam-Fai Chan and Kathleen L. Hussey of Columbia University College of Physicians and Surgeons, New York, report in the *Journal of the American Medical Association* (June 9).

The method is to give the worm medicine, piperazine citrate, in large daily doses instead of in smaller doses several times a day. With this method, 58 of 60 patients were cured of pinworms in seven days instead of 14. One large dose cured 34 of 46 victims of roundworms, while two large doses cured 50 of 53 patients.

Pinworms infect 16,000,000 persons in the United States and more than 200,000,000 persons in the world, it is estimated. The infection is not limited to the poor and rural classes, but is found in all groups.

Science News Letter, June 23, 1956

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ASTRONOMY

48 Dwarf Galaxies Found in Virgo Cluster

► DISCOVERY of 48 dwarf galaxies in the huge cluster of star systems found beyond the stars of the constellation of Virgo, the virgin, has been reported by Dr. Gibson Reaves of the University of Southern California.

The cluster of galaxies in which the 48 dwarfs were spotted contains about 1,000 stellar systems, and more dwarf galaxies may be found in Virgo by future surveys.

Science News Letter, June 23, 1956

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BIOLOGY

NATURE RAMBLINGS
by Horace Loftin



Summer Songster

► AS LAZY SUMMER DAYS begin, the air of wooded regions is filled with the shrill, "monotonous" song of cicadas. The word "monotonous" is put in quotation marks because to insect ears the song of the cicada is far more complicated than is evident to humans.

Human ears and the ears of most other land-dwelling vertebrates are sensitive to differences of pitch in sounds. Thus, the rise and fall of pitch is what this type of ear is attuned to hear. Insect-ears, on the other hand, are not so attuned to pitch as to the "beat," or the pulse pattern of sound.

The human listener, then, only hears a "monotonous" whir, with little interesting variation in pitch, as the cicada sings. How-

ever, the female cicada, listening to the male (only the male sings), hears an elaborate pattern of pulsating sound that the human ear misses.

As a British expert on insect sound, J. W. S. Pringle, has remarked, it is only because of the inability of the human ear to detect the significant features of many insect songs that their great variety has long gone unsuspected.

Most sound-producing land vertebrates use the rush of air over organs like vocal cords to make sound. Insects lack the kind of respiratory airstream necessary for this kind of noise-making. Therefore, their hard external skeleton and the air spaces within their bodies act as "drums" to make a variety of sounds.

Cicadas make their song by the rapid buckling of a specially modified section of their first abdominal segment. The abdominal cavity contains a large air sac that increases the volume of the clicks caused by the buckling, like the cavity of a drum increases the volume of sound produced by beating on the drum head.

To produce the typical song of the cicada, the buckling is carried out at an extremely rapid rate.

To achieve this, the "buckling" muscle is different from all other striated muscle except the indirect wing muscles of flies, bees and a few other insects. Its contraction and expansion are not controlled from the central nervous system, but by stimulation within the muscle itself.

Science News Letter, June 23, 1956

BIOCHEMISTRY

Test for Mental Illness

► A RELATIVELY SIMPLE CHEMICAL test for the serious mental sickness, schizophrenia, has been developed by Drs. Patrick L. McGeer, Edith Graef McGeer and William C. Gibson of the University of British Columbia, Vancouver, and the Crease Clinic of Psychological Medicine, Essondale, British Columbia.

In more than 80% of newly admitted patients, the diagnosis of schizophrenia could be predicted from the test.

The test depends on finding a class of chemicals called diazo-coupling compounds in the urine. The chemicals are detected by characteristic spots of color found by chromatography.

The scientists started their work because of the theory that schizophrenia may involve an error of body chemistry resulting in the body's synthesis of a chemical similar to mescaline and LSD-25.

These two chemicals can produce schizophrenia symptoms temporarily in normal persons.

The known chemicals that produce such symptoms and the tranquilizing drugs that overcome them all have one common and perhaps significant structural characteristic, which chemists call an activated aromatic ring. If the body makes such a chemical,

it might also have this characteristic structural feature.

To test this theory, the Vancouver scientists studied the urine of normal persons and schizophrenia patients for differences in aromatic chemicals excreted. The schizophrenics, they found, excreted more of the diazo-coupling compounds.

Based on a scale of 11, the average for these compounds excreted by the schizophrenics was six, while that for normal persons was 2.8. Of 13 patients who had ratings of three or less, 10 were responding well to treatment, while of 19 with ratings of eight or more, 18 had shown no response to treatments.

This seems to indicate that the test might also be used to show whether treatment was having any effect.

Besides the schizophrenia patients, the scientists tested patients with other mental diseases. These averaged scores about the same as normal persons.

More than 700 persons, including many normal ones and about 400 patients newly admitted to the mental hospital, have been tested. The results are in excellent agreement with those from persons first tested, the scientists report in *Science* (June 8).

Science News Letter, June 23, 1956

MEDICINE

Polio Conquest Coming

Use of polio vaccine expected to reduce the number of virus carriers in the population, leading to the day when poliomyelitis may be almost entirely eliminated.

► THE CONQUEST OF POLIO may be coming faster than is generally realized, reports to the American Medical Association meeting in Chicago showed.

Vaccination against polio may do more than reduce the number of cases of paralytic polio, Dr. Jonas E. Salk of the University of Pittsburgh pointed out in discussing the latest findings on the vaccine he developed.

It may limit or prevent infection with polio virus, thus reducing the number of virus carriers who constitute a reservoir in the population.

This possibility appears from the finding that, in vaccinated persons, even after detectable antibodies to polio virus have disappeared, there is still a state of hyper-reactivity. This state calls forth antibody development so fast after exposure that invasion of the brain or spinal cord may be blocked.

This can happen even though the virus may have infected the throat or intestinal tract.

That this may happen is shown by the reduction in the summer of 1955 not only of paralytic, but also of non-paralytic, polio in vaccinated persons.

Polio virus invades the blood stream through the throat or intestinal tract. It may then retrace its steps and invade previously uninjected parts of the throat or intestinal tract and be excreted from the body. If antibodies, developed as a result of vaccination, can block this secondary invasion, vaccinated persons would be less

infectious for others. This point was brought out by Dr. David Bodian of Johns Hopkins University, Baltimore, Md.

In addition, unvaccinated parents of young children would therefore be protected.

The importance of this appears from a report by Dr. John H. Paul of Yale University, New Haven, Conn.

The change in age at which polio now attacks in the United States, he said, may be due to the fact that young parents are heavily exposed to the infection in their young children, even when the children are not sick with polio.

Safety testing of polio vaccine may become even better in the future, Dr. Bodian said. The monkeys used in the testing can be treated with cortisone to make them more susceptible to the polio virus. Being more susceptible, they will be more sensitive to small amounts of it that might have escaped inactivation and still be in the vaccine.

Vaccine Reduced Cases

► THE POLIO VACCINE reduced paralytic polio among vaccinated children "at least 75%" last year, Dr. Leonard A. Scheele, Surgeon General, U. S. Public Health Service, reported at the American Medical Association meeting in Chicago.

At the same time, he urged doctors to continue vaccinating children all summer as supplies become available.

The polio season lasts many months, he said, and for the country as a whole will not begin its slow decline until about September.

"Vaccine given in July and August will prevent paralytic cases and even deaths in August and September," Dr. Scheele said.

Larger releases of vaccine during the coming months are expected, he said. He also gave reassurance on the safety of currently produced vaccine.

"Since last May, when vaccine was first released under the revised safety standards, there has been no epidemiologic evidence that any lot of vaccine of any manufacturer has been unsafe," he said.

"This reassuring conclusion is drawn from the study of data on each reported case, mechanically sorted and tabulated according to the lot number of the vaccine, date and site of injection, site of first paralysis, and dates of onset of the disease and of paralysis. Special attention has been directed toward cases which occur within 30 days of inoculation and to paralytic cases showing first paralysis at the site of injection.

"From over 40,000,000 inoculations, there

has been no more than one case in any one lot which could have been regarded as suspicious in any way. This is well within the limit of expected coincidence when size of lot, geographic distribution, and amount of polio in the area at time of use are considered."

The vaccine, he noted, is not claimed to be 100% effective and some cases of polio can be expected to develop in vaccinated persons.

The figures on the effectiveness of the vaccine last year came from studies by 22 states and New York City involving over 8,500,000 vaccinated and unvaccinated children.

The over-all attack rate among the vaccinated, most of whom had only one injection, was 6.3 per 100,000. The rate among the unvaccinated was 29.2 per 100,000.

Science News Letter, June 23, 1956

Questions

BIOCHEMISTRY—What is now believed the cause of athlete's foot itching? p. 392.

□ □ □

ENTOMOLOGY—How long does it take a mosquito to digest blood? p. 388.

□ □ □

GENERAL SCIENCE—What are the biological effects of radiation? p. 387.

□ □ □

MEDICINE—What are the chances of ileitis recurring? p. 388.

□ □ □

METEOROLOGY—How might an H-bomb war affect the earth's heat balance? p. 393.

□ □ □

PSYCHIATRY—What is effect of tranquilizing drugs on the cure rate of those mentally ill? p. 396.

□ □ □

Photographs: Cover, North American Aviation, Inc.; p. 387, Hughes Aircraft Company; p. 389, General Electric Company; p. 391, Westinghouse Electric Corporation; p. 400, Eastman Chemical Products, Inc.

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❶ **THREAD RESTORER KIT** contains six chaser taps and dies. The set is described as eliminating the need to replace burred or stripped inverted fittings, and will restore crossed or distorted tube-fitting threads. The taps and dies can be used to re-thread male or female threads on oil, fuel and hydraulic lines.

Science News Letter, June 23, 1956

❷ **PACKAGING PLASTIC**, chemically inert and non-toxic, can be used to package almost everything from acid to machine parts. The clear film combines the strength and oil-resistance of polyester films and the heat sealable properties and corrosive-fluid resistance of polyethylene films. It is available in widths up to 22 inches and lengths as desired.

Science News Letter, June 23, 1956

❸ **DRY SHAVER** winds up like a watch and can be used anywhere without electricity, water or wires. The shaver runs for three minutes on one winding and is equipped with two heads for ordinary shaving and trimming. This Swiss-made shaver comes in a red leather case.

Science News Letter, June 23, 1956

❹ **PARTY TABLE** permits the hostess to serve her guests a full-course meal anywhere around the home. The tray section is made of laminated safety glass, the legs of tubu-



lar steel and both are capped with a butyrate plastic trim. The pull-up table, shown in the photograph, can be used for writing, reading or cards, and folds for storage.

Science News Letter, June 23, 1956

❺ **RECORD SAVER** for storing hi-fidelity discs has heavy self-closing plastic containers

suspended from slide rods. Made of transparent plastic, the hi-fi fan can select the record he wants without the need of an index. The storer also eliminates the need for albums or jackets. Each unit holds 50 records.

Science News Letter, June 23, 1956

❻ **FIREARMS INSPECTOR** is a mirror-magnet for looking into the bore of rifles, pistols and shotguns during cleaning. The four-inch tool is affixed to the weapon, and the cleaner is then able to adjust the swivel-headed mirror to reflect light through the barrel to spot dirt or oil.

Science News Letter, June 23, 1956

❼ **MARINE SEALER** offers the boat builder an adhesive that does not require mixing and can be used at any temperature. The neoprene sealer sets in 12 hours. An open can of this sealer has a pot-life of two hours. The sealer is resistant to gasoline, oil, salt water and sunlight.

Science News Letter, June 23, 1956

❽ **KITCHEN DISH RACK** speeds up dishwashing by eliminating the need to dry dishes or put them away. Wall-mounted and designed to fit over the sink, the time-saver is made of birch, with anodized aluminum brackets. The racks are available in 36-, 45- or 54-inch lengths, countertop and two-deck models.

Science News Letter, June 23, 1956

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Certain types of presently available porcelain enamel frits have been found to have satisfactory lubricating properties when used in titanium sheet-metal forming operations above 800 degrees Fahrenheit.

An automatic airplane navigator is said to follow precise rules of logic in reasoning whether to accept, reject or demand confirmation of data fed into it.

A snowshoe superior to those of the Eskimos has been developed; it is made of feather-weight magnesium with nylon-encased wire strings.

A new pellet-type cereal-based food for trout will produce one pound of fish for each two pounds of feed.